Space Weather Forecast

Issued on Wednesday, 19 July 2023 at 01:18 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 Blackouts likely throughout. Chance of Minor/Moderate Geomagnetic Storms during 20 July.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was Moderate, with several M-class flares observed. The largest was a long duration M5.7 peaking at 18/0006 UTC and originating from a large region in the southwest quadrant, near the horizon. Another long duration flare was observed later in the day peaking at M2.1 at 18/2027 UTC, again from the same source. There are currently ten sunspot regions on the visible disc. A number of large groupings are evident in the northern hemisphere, and three of these are notably close to centre disc. A significant asymmetric halo CME (Coronal Mass Ejection) was observed leaving the Sun from the southwest limb, related to the flare and this appears to have an Earth-bound component.

Solar Wind / Geomagnetic Activity: The solar wind parameters continued to display a waning trend following the CME which arrived at earth on 16 July. The solar wind speed eased from elevated levels (550km/s) to slightly elevated (460km/s). The total magnetic field remained at weak levels. The important north-south component was also at weak levels and passed through a short period of negative strength early in the period. This resulted in Quiet to Unsettled geomagnetic activity with some active intervals observed.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) became Moderate shortly after the long duration flare emitted by the large region in the southwest quadrant (near the horizon), The flux rose above the moderate threshold after 18/0200 UTC and nearly reached the strong radiation storm threshold. Radiation storm levels have now declined to S1 minor storm levels.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to remain Moderate, with occasional Moderate class flares and a slight chance of an isolated strong flare, and this is most likely to originate from the largest sunspot grouping which is AR3373, located in the northeast.

Solar Wind / Geomagnetic Activity: Current CME influence is expected to gradually ease during day 1 (19 July). A fast solar wind may connect with Earth but this is most likely to be masked by the already elevated solar winds. Another CME was observed leaving the sun after the M5.7 flare that occurred on 18/0000UTC. This will probably affect Earth early on Day 2 (20 July) with effects continuing into the day 3 (21 July). Geomagnetic activity is therefore expected to be Quiet to Unsettled on day1 (19 July) with a chance of an active interval, then there is an increasing probability of G1/G2 (Minor/Moderate) storms intervals on day 2 (20 July). Activity returning to Quiet with a chance of Unsettled intervals by day 4 (22 July) as CME effects wane, but confidence is low as it largely depends on the arrival time of the CME.

Energetic Particles / Solar Radiation: Further solar radiation storms are possible early in the guidance period, especially if the large region in the southwest quadrant emit another large flare.

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This risk declines over the following days as this region rotates onto the far side. Currently the ongoing minor solar radiation storm will probably continue for much of the guidance period, especially if another significant proton rich flare is emitted.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	50	10	1
Strong	G3	No	1	10	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	80	70	70	70
Very Active	R3 to R5 X	No	20	15	15	15

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	80	60	50
Very Active	≥ S3 *	No	10	5	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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